



# Distribution of *Lunaria telekiana* (Brassicaceae), a poorly known species of European concern

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**ABSTRACT:** *Lunaria telekiana* Jávorka is usually treated as a narrow N.E. Albanian endemic, distributed only in Prokletije Mts (Bjeshkët e Nemuna), S.E. Dinaric Alps. As a European endemic, and restricted to a single European country, *L. telekiana* is treated as a “target species”, or “species of European concern”. As a very rare and endangered species it is defined as IUCN CR B2a in Europe.

Although of great international significance, the distribution of *L. telekiana* is only poorly known, without any georeferenced records on GBIF. Except for the locus classicus “Škelsen ad pagum Tropoja”, as well as localities “Bajram Curri” and “Maja e Hekurave” in Albania, all other published and unpublished data on the distribution of this species are largely unknown.

Based on several years of field studies, analyses of herbarium and literature data, the authors managed to record the occurrence of *L. telekiana* in Albania, Montenegro and Serbia, and to outline its distribution range more precisely.

The size of plant populations at the studied localities and new threatened status according to criteria and categories of IUCN have been established individually for Europe, Albania, Montenegro and Serbia.

**KEY WORDS:** *Lunaria*, endemic species, critically endangered species, distribution, Balkan Peninsula

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## INTRODUCTION

The species *Lunaria telekiana* was described by S. Jávorka on the basis of material collected, on 5<sup>th</sup> September 1918, at the locality Mali i Shkëlzenit (Mt. Shkelzen) above Tropoja in N.E. Albania (JÁVORKA 1922). This is a European endemic (GREUTER *et al.* 1986, BALL 1993, JALAS *et al.* 1996, OZINGA & SCHAMINÉE 2005; MARHOLD 2011), hitherto considered as a narrow endemic of the Albanian part of the Prokletije Mts (RAKAJ 2009), and being distributed in only one European country defined as a “target species”, or “species of European concern”

(OZINGA & SCHAMINÉE 2005). In addition to the classical locality, this species has also been recorded in other other up till now known localities: Bajram Curri and Maja e Hekurave in Albania (PAPARISTO *et al.* 1988: 338, BALL 1993: 358, MEYER 2011: 63), Gusinjske Prokletije in Montenegro (Wraber 1989), and Koprivnik in Serbia (Niketić 2010). After the last consolidation of the list of strictly-protected plant species, *L. telekiana* is included in Annex I of the Bern Convention (HEYWOOD 2009). Also, as a very rare and endangered species, *L. telekiana* is defined as IUCN CR B2a in Europe and Albania (HEYWOOD 2009, according to BUORD & LESOËUF 2006)

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as well as Montenegro (PETROVIĆ *et al.* 2008). According to national legislation, *L. telekiana* is a strictly protected species in Albania (tpvs46a 2001), Montenegro (SL, RCG 76/2006) and Serbia (SL, RS 5/2010), and it is included in the red list of Albanian flora (VANGJELI *et al.* 1995). There are no data on whether this species has been included in any known Recovery Program (HEYWOOD 2009).

Although being of great international significance, the distribution of *L. telekiana* is only poorly known, and precise or georeferenced records on GBIF (HEYWOOD 2009) are lacking.

Recent findings of *Lunaria telekiana* at new localities in Albania as well as other neighboring countries showed discrepancy between knowledge of an international significance for conservation and basic knowledge on its distribution. Hence, the primary goal of this contribution is to gather all known data about the species' distribution and ecological affinities to provide detailed data for efficient conservation planning.

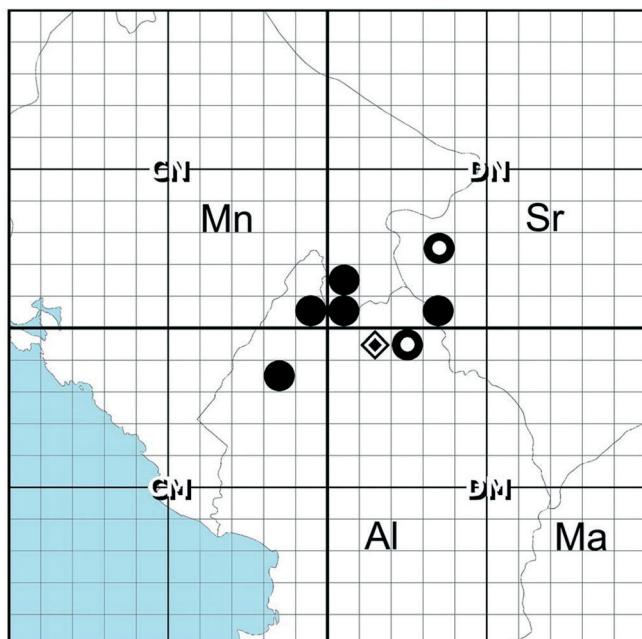
## MATERIAL AND METHODS

Our investigations were based on recent field studies, analysis of herbarium material deposited at BEOU, BEO, BP, LJU and NHMR (herbarium acronyms according to HOLMGREN *et al.* 1990), as well as literature data. The locations for occurrences of the species in the field were recorded with GPS (Garmin eTrex Legend HCx and Garmin eTrex Vista C). All other data on the distribution were georeferenced in OziExplorer 3.95 4s program. The chorological data are presented according to the grid map with squares of c. 10 km × 10 km, based on the Universal Transverse Mercator (UTM) projection (LAMPINEN 2001), grid zone 34T. Latitudes and longitudes are given according to the World Geodetic System 84 (WGS84). Phytosociological characteristics of sites with *L. telekiana* were studied according to the Braun-Blanquet approach (BRAUN-BLANQUET 1928; WESTHOFF & VAN DER MAAREL 1973; DIERSCHKE 1994).

The estimation of threatened status of *L. telekiana* for the territory of Europe, Albania, Montenegro and Serbia is made according to criteria and categories of IUCN (2001).

## RESULTS

During field trips of the last few years, *L. telekiana* was observed and/or collected at seven localities in Albania and Montenegro, and its occurrence at five additional localities has been registered in the literature and herbarium collections. Altogether, until now we have registered and georeferenced 13 localities in Albania, Montenegro and



**Fig. 1.** Distribution of *Lunaria telekiana* (UTM Grid zone 34T; basic square 10 x 10 km). Locality symbols: ● field data, ○ literature data - high accuracy, ◆ literature data - low accuracy. Abbreviations: Mn - Montenegro, Sr - Serbia, AI - Albania, Ma - FYR Macedonia.

Serbia (Kosovo). These localities are situated in eight UTM squares of 10 km × 10 km (Tab. 1, Fig. 1). Seven localities were georeferenced with maximal accuracy by GPS; five localities were georeferenced by means of OZI explorer on the basis of 1:25,000 topographic maps with an accuracy of 1 × 1 km; only one locality, Mt Maja Hekurave, was georeferenced with an accuracy of 10 × 10 km in OZI explorer on the basis of a 1:500,000 UTM map (Tab. 1).

Altogether seven voucher specimens from different localities were deposited in BP, NHMR, LJU, BEOU and BEO, four field observations were made during recent field trips and four were previously recorded in the literature.

### Literature data

- ALBANIA: Mali i Shkëlzenit (JÁVORKA 1922: 1; 1926: 246; HAYEK 1925 1: 425; PAPARISTO *et al.* 1988: 338; BALL 1993: 358; VANGJELI. *et al.* 2000: 49);
- ALBANIA: Maja e Hekurave (BALL 1993: 358; VANGJELI. *et al.* 2000: 49);
- ALBANIA: Maja e Hekurave: Ne vende shkembore te Dragobise (VANGJELI. *et al.* 1995: 100);
- ALBANIA: Bajram Curri (PAPARISTO *et al.* 1988: 338);
- ALBANIA: Kolgecaj (Bajram Curri), Gryka e Likenit, westlich Kolgecaj, ca. 1200 m, 14.V.1960, 5665 (MEYER 2011: 63);
- MONTENEGRO: Prokletije: Volušnica (WRABER 1989: 294; PETROVIĆ *et al.* 2008: 619-620);
- MONTENEGRO: Prokletije: Ljubokuč (WRABER 1989:

**Table 1.** Georeferenced data on the distribution of *Lunaria telekiana* (coordinates in WGS84)

Location	Latitude	Longitude	Altitude (m a.s.l.)	UTM (zone 34T)	Accuracy
ALBANIA: Tropoja, Mali i Shkëlzenit	42.458424	20.150252	1200	DN30	10 m
ALBANIA: Përroi i Tropojës	42.457487	20.155514	822	DN30	10 m
ALBANIA: Bajram Curri	42.356732	20.059518	500	DM29	1 km
ALBANIA: Bajram Curri, Gryka e Liqenit	42.3692	20.0359	1200	DM29	1 km
ALBANIA: Maja e Hecurave	42.414594	19.965648		DM19	10 km
ALBANIA: Parun, Mshitel	42.311467	19.629731	1465	CM88	10 m
ALBANIA: Parun, Qafa e Shtogut	42.314167	19.660278	1268	CM88	10 m
MONTENEGRO: Karanfili, Kotlovi	42.50602	19.78134	1454	CN90	10 m
MONTENEGRO: Karanfili, Ljubokuč	42.513064	19.79105	1600	DN00	1 km
MONTENEGRO: Karanfili, Karlica	42.514381	19.794386	1150	DN00	10 m
MONTENEGRO: Karanfili, Volušnica	42.51275	19.77655	1250	CN90	1 km
MONTENEGRO: Karanfili, Mecin do	42.5201389	19.7907499	1250	DN00	10 m
MONTENEGRO: Visitor, Preslo	42.616	19.894	1800	DN01	10 m
SERBIA (Kosovo): Koprivnik	42.65156	20.235674	1500	DN32	1 km

294; PETROVIĆ et al. 2008: 619-620); SERBIA (KOSOVO): Prokletije: Koprivnik (NIKETIĆ 2010: 33).

#### Herbarium data

ALBANIA: Albania borealis, tractus Alpium Albaniæ borealium ("Bertiscus"), ad faucem rivi Valbona prope pag. Kolgecaj (Bajram Curri). In solo calcareo. (leg.: JÁVORKA & UJHELI 524504, 30.06.1955, BP!).

ALBANIA: Albania borealis, tractum Alpium borealium Albaniæ, in saxosis silvaticis ad faucem vallis. Valbona prope pag. Bajram Curri (Kolgecaj), alt. c. 500 m a.s.l. (leg.: JÁVORKA & UJHELI 712782, 30.06.1955, BP!, designated as neotypus by D. Kováts IX. 1999)

ALBANIA: District of Tropoje (Rrethi i Tropojës), between villages Papaj and Sylbice, in the valley of stream përroi i Tropojës; in limestone scree. 42,45719 N, 20,16067 E, 822 m a.s.l. (leg.: Barina, Z., Kovács, A., Puskás, G., Sárosbátki, B. 19407, 07.07.2011, BP!)

MONTENEGRO: Prokletije, Ad radices montis Volušnica in valle Grbaja, in glareosis calcareis herbosis. 1250 m a.s.l (leg.: Lovka, M., Wraber, T. 31188, 15.07.1987, LJU!)

MONTENEGRO: Prokletije, Karanfili, Kotlovi, 42.50602 N, 19.78134 E, tall herb vegetation, *Betulo-Adenostyletea*, limestone, 1306 m a.s.l. (leg.: Lakušić, D. 31188, 17.07.2010, BEOU!)

MONTENEGRO: Prokletije, Karanfili, Mecin do, 42.52013893 N, 19.79074996 E, screes, *Drypetalia spinosae*, limestone, 1280 m a.s.l. (leg. Lakušić, D., Kuzmanović, N., Surina, B., Di Pietro, R., Radalj, A. 33477, 25.07.2011, BEOU!, NHMR!)

SERBIA (Kosovo): Flora Bertisci 07129, in fauce ca. 1500

m a.s.l., supra Rugovo, Mt. Koprivnik, ca. Peć (sub *Lunaria annua* L. ssp. *pachyrhiza* (Borb.) Hayek f. *fallax* Beck, leg.: Grebenščikov, O. 16.07. 1939, BEO!, rev. Niketić, M., 11.09.2001).

#### Field observation

MONTENEGRO: Prokletije, Karanfili, Karlica, towards Očnjak (Maja Njer e Krit), tall-herb vegetation (*Praščević*, M., Surina, B., 6.7.2008)

MONTENEGRO: Prokletije, Visitor, Preslo above the Gropa, at the margin of the subalpine beech forest (*Praščević*, M., Surina, B., 8.7.2008)

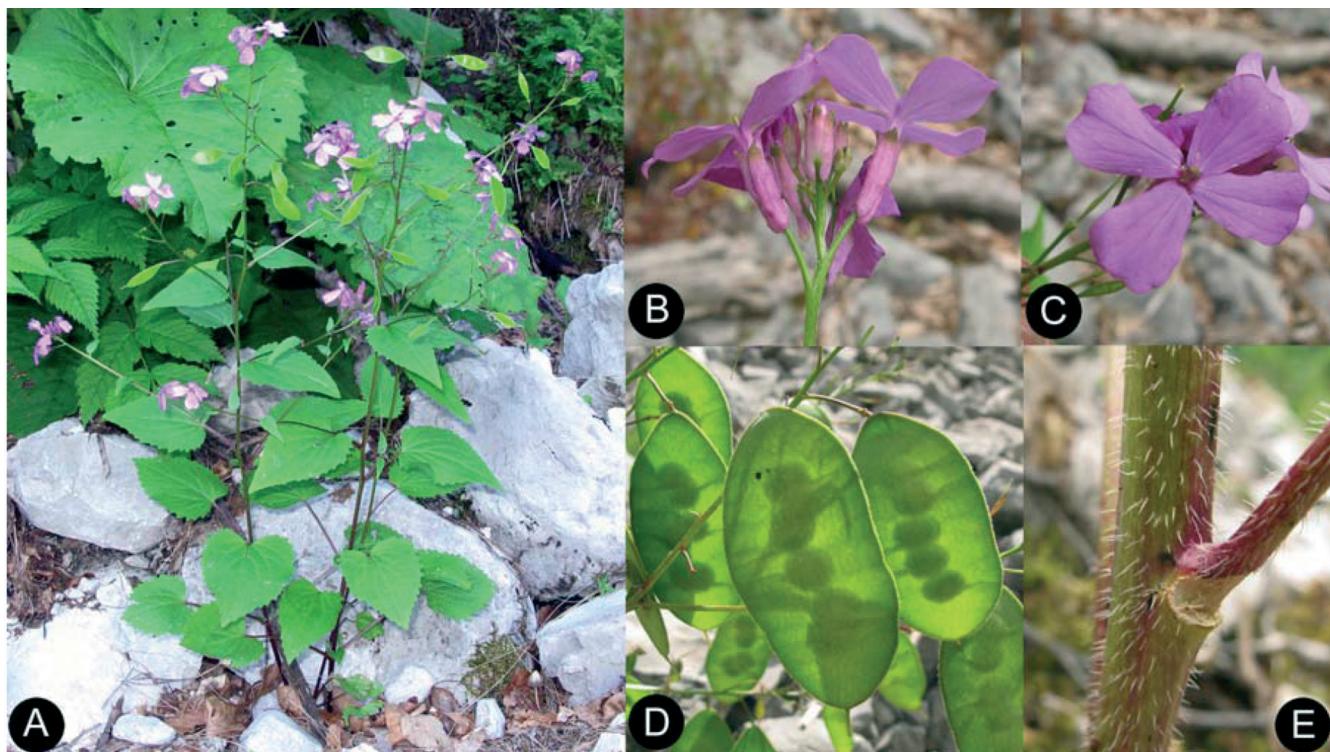
ALBANIA: Parun, toward Mshitel pass, (Rakaj, M., Surina, B., 18.08.2007)

ALBANIA: Parun, Qafa e Shtogut pass (Rakaj, M., Surina, B., 17.7.2008)

**Habitat preferences.** *Lunaria telekiana* is most often a species of open calcareous screes (*Thlaspietea rotundifoliae* Br.-Bl. et al. 1947, *Drypetalia spinosae* Quezel 1967) in the altimontane and subalpine vegetation belt (1100-1600 m a.s.l.), although its total altitudinal range extends between 500 to 1800 m a.s.l.

1. Locality: Montenegro, SE Dinaric Alps, Prokletije Mts, Grebaja valley, calcareous scree above the valley, 42.52013893N, 19.79074996E, 1280 m a.s.l., exp. N, incl. 40°, limestone scree; herb layer: 30 %, moss layer: 10 %; rel. area: 70 m²; leg.: Lakušić, D., Kuzmanović, N., Surina, B., Di Pietro, R., Radalj, A.; date: 25.7.2011.

*Sedum ochroleucum* 2, *S. album* 2, *Lunaria telekiana* 1, *Achillea abrotanifolia* +, *Ceterach officinarum* +, *Cystopteris*



**Fig. 2.** *L. telekiana*: A) habitus, B-C) flowers with saccate base of sepal, D) silicula with short carpophore and densely ciliate margin of valves, E) Indumentum of the base of the stem. All from MONTENEGRO: Prokletije, Karanfili, Kotlovi, 42.50602 N, 19.78134 E and Mecin do 42.52234 N, 19.79539 E, screes, limestone 1450-1500 m (photo D. Lakušić).

*fragilis* +, *Galium album* +, *Geranium robertianum* +, *G. rotundifolium* +, *Linaria peloponnesiaca* +, *Melica cf. ciliata* +, *Mycelis muralis* +, *Rhamnus fallax* +, *Rumex scutatus* +, *Saxifraga rotundifolia* +, *Scutellaria altissima* +, *Sedum sexangulare* +, *Sempervivum heuffelii* +

2. Locality: as above, exp. N, incl. 40°, limestone scree; herb layer: 30 %, moss layer: 5 %; rel. area: 80 m<sup>2</sup>; leg.: as above; date: as above.

*Rumex scutatus* 2, *Lunaria telekiana* 1, *Sedum album* 1, *S. ochroleucum* 1, *Allium sphaerocephalum* +, *Aurinia corymbosa* +, *Dianthus petraeus* +, *Geranium robertianum* +, *Lapsana* sp. +, *Leucanthemum* cf. *montanum* +, *Melica cf. ciliata* +, *Mycelis muralis* +, *Saxifraga rotundifolia* +, *Stachys baldaccii* +

However, it may occur in stands of tall-herbs communities (*Mulgedio-Aconitetea* Hadač & Klika in Klika 1948, *Cicerbitetalia panciciana* Lakušić 1978) with dominating *Cicerbita pancicii*, *Geum bulgaricum*, *Veratrum album*, *Adenostyles alliariae* and *Wulfenia carinthiaca* (as observed above the Grebaja valley and bellow the Karanfili (Karlica, toward Očnjak – Maja Njer e Krit, and Kotlovi), as well as subalpine beech stands. A relevé of a beech stand with *Lunaria telekiana* is further given:

3. Locality: Montenegro, SE Dinaric Alps, Prokletije Mts, Mt. Visitor, Preslo above Gropa, 42.616N, 19.894E, 1800 m a.s.l.; subalpine beech forest on limestone; exp. NW, incl. 35°; tree layer: 90 %, shrub layer: 5 %, herb layer: 80 %, moss layer: 10 %, stoniness: 5 %; rel. area: 70 m<sup>2</sup>; leg. Praščević, M., Surina, B.; date: 8.7.2008.

Tree layer: *Fagus sylvatica* 5, *Abies alba* +; shrub layer: *Fagus sylvatica* 1, *Daphne mezereum* 1, *Lonicera alpigena* 1, *Abies alba* +; herb layer: *Cardamine enneaphyllos* 2, *Galeobdolon montanum* 2, *Galium odoratum* 2, *Asyneuma pichleri* 1, *Cardamine bulbifera* 1, *Euphorbia amygdaloides* +, *Fagus sylvatica* 1, *Symphytum tuberosum* 1, *Veratrum album* 1, *Wulfenia carinthiaca* 1, *Aconitum penneri* +, *Adenostyles alliariae* +, *Cicerbita pancicii* +, *Daphne mezereum* +, *Dryopteris filix-mas* +, *Gentiana asclepiadea* +, *Lasertpitium krapfii* +, *Lunaria telekiana* +, *Milium effusum* +, *Mycelis muralis* +, *Pinus peuce* +, *Polygonatum verticillatum* +, *Polystichum aculeatum* +, *Prenanthes purpurea* +, *Sanicula europea* +, *Saxifraga rotundifolia* +, *Senecio fuchsii* +, *Thalictrum aquilegifolium* +, *Veronica urticifolia* +.

In both cases, the soils were very shallow and skeletous, and together with other site parameters clearly indicating recent vegetation succession from open calcareous scree stands towards forest stands.

## DISCUSSION

*L. telekiana* is an easily recognizable species, which, unlike the related *L. rediviva* L., has very specific silicula with short carpophore (c. 1 mm), densely ciliate margin of valves, 2-2.5 mm long saccate base of sepals, cordate leaves with dentate-crenate margins and very strong and spiky hairs at the bases of stems (Fig. 2).

Almost until the end of the twentieth century, only Mali i Shkëlzenit (= Mt. Shkelzen, *locus classicus*), Bajram Curri and Maja e Hekurave in Albania were known as places of occurrence of *L. telekiana*. Therefore, this species is usually treated as a narrow N.E. Albanian endemic distributed only in the Albanian part of the Prokletije Mts (Bjeshkët e Nemuna). Although there are a few recently published records on its presence in Montenegro and Serbia (WRABER 1989; PETROVIĆ et al. 2008; NIKETIĆ 2010), *L. telekiana* has been generally an overlooked species in these two countries (BALL 1993; JALAS et al. 1996; OZINGA & SCHAMINÉE 2005; MARHOLD 2011).

As a result of our research, the occurrence of *L. telekiana* was confirmed in Montenegro and Serbia, while a few localities were newly discovered for Albania and Montenegro, and it proved to be a relatively common species in the vegetation of the altimountane-subalpine calcareous screes and tall-herb vegetation in the area of Prokletije Mts. in the SE Dinaric Alps. In addition, eleven localities were georeferenced with maximal or high accuracy.

As an endemic with a very restricted distribution range in Europe, *L. telekiana* is defined as a species of great international (OZINGA & SCHAMINÉE 2005; BUORD & LESOËUF 2006; HEYWOOD 2009), and national significance (BUORD & LESOËUF 2006; HEYWOOD 2009; PETROVIĆ et al. 2008). However, previous assessments of the status and vulnerability of this species were based on herbarium and frequently imprecise literature data.

During our field research, we made the first estimates of the number of individuals and population condition. Thus, the Montenegrin population at Karanfili (Kotlovi, Mecin do, Karlica) above the Grebaja valley has more than a few hundred individuals which are likely to be in good reproductive condition, given that a very large number of individuals in full fruiting stage were registered. However, in the southern part of the Prokletije Mts, the Parun mountain range, a significantly lower number of specimens was observed. Hence, both on Qafa e Shtogut and Qafa e Mschitel we estimate an occurrence of up to a hundred individuals. In the Tropoja valley, altogether many hundreds or a few thousands of specimens are estimated to occur on calcareous screes. These subpopulations are likely referring to those published under the toponym "Shkëlzen" (*locus classicus*). The population in the

Tropoja-valley thrives at relatively low altitude.

On the basis of new chorological data and estimation of the number of individuals and population condition, we can define *L. telekiana* as IUCN VU B1a+2a in Europe, IUCN EN B1a+2a in Albania and Montenegro, and CR B1a (DD) in Serbia.

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## REZIME

# Rasprostranjenje *Lunaria telekiana* (*Brassicaceae*), slabo poznate vrste od evropskog interesa

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*Lunaria telekiana* Javorka se obično tretira kao striktno severoistočno albanska endemična vrsta, sa veoma uskim rasprostranjenjem u Prokletijama (jugoistočni Dinarići). Kao evropski endemit koji je svojim rasprostranjenjem ograničen samo na jednu evropsku zemlju, *L. telekiana* se tretira kao "ciljna vrsta" (target species) ili "vrsta od evropskog interesa" (species of European concern). Kao veoma retka i ugrožena ova vrsta je u Evropi definisana kao IUCN CR B2a.

Mada je vrsta *L. telekiana* nesumnjivo vrsta od velikog međunarodnog značaja, njena distribucija je veoma slabo poznata, bez ijedne georeferencirane informacije evidentirane u GBIF-u. Osim klasičnog nalazišta "Škelsen ad pagum Tropoja", kao i lokaliteta "Bajram Curri" i "Maja e Hekurave" u Albaniji, svi ostali objavljeni i neobjavljeni podaci o rasprostranjenju ove vrste su uglavnom nepoznati.

Na osnovu višegodišnjih terenskih istraživanja i analize literaturnih i herbarijumske podataka, u radu su prikazani podaci o svim poznatim nalazištima vrste *L. telekiana* u Albaniji, Crnoj Gori i Srbiji.

Procena veličine populacija na ispitivanim lokalitetima, kao i nova procena statusa ugroženosti u skladu sa IUCN kriterijumima i kategorijama su pojedinačno predstavljeni za Evropu, Albaniju, Crnu Goru i Srbiju.

**Ključne reči:** *Lunaria*, endemične vrste, kritično ugrožene vrste, rasprostranjenje, Balkansko poluostrvo.